National Institute of Environmental Health Sciences

Relevant microclimate for determining the development rate of malaria mosquitoes and possible implications of climate change

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Abstract:

BACKGROUND: The relationship between mosquito development and temperature is one of the keys to understanding the current and future dynamics and distribution of vector-borne diseases such as malaria. Many process-based models use mean air temperature to estimate larval development times, and hence adult vector densities and/or malaria risk. METHODS: Water temperatures in three different-sized water pools, as well as the adjacent air temperature in lowland and highland sites in western Kenya were monitored. Both air and water temperatures were fed into a widely-applied temperature-dependent development model for Anopheles gambiae immatures, and subsequently their impact on predicted vector abundance was assessed. RESULTS: Mean water temperature in typical mosquito breeding sites was 4-6 degrees C higher than the mean temperature of the adjacent air, resulting in larval development rates, and hence population growth rates, that are much higher than predicted based on air temperature. On the other hand, due to the non-linearities in the relationship between temperature and larval development rate, together with a marginal buffering in the increase in water temperature compared with air temperature, the relative increases in larval development rates predicted due to climate change are substantially less. CONCLUSIONS: Existing models will tend to underestimate mosquito population growth under current conditions, and may overestimate relative increases in population growth under future climate change. These results highlight the need for better integration of biological and environmental information at the scale relevant to mosquito biology.

Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2912924

Resource Description

Exposure : ☑

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Precipitation, Temperature

Temperature: Fluctuations

Geographic Feature: ☑

resource focuses on specific type of geography

Other Geographical Feature

Other Geographical Feature : highlands;lowlands

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Africa

African Region/Country: African Country

Other African Country: Kenya

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Mosquito-borne Disease

Mosquito-borne Disease: Malaria

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction, Methodology

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Short-Term (